ECONOMIC IMPACT OF AGRICULTURE TECHNOLOGY IN INDIA (WITH SPECIAL REFERENCE TO BIHAR)

Synopsis

Submitted for Registration of Degree of Doctor of Philosophy
in
Applied Business Economics
(Commerce)

Under the Supervision of:
Dr. Saurabh Mani

Co- Supervisor:
Dr. Suneshwer Prasad

Submitted by:
Gaurav Kumar Saurabh

Department of Applied Business Economics
Faculty of Commerce
Dayalbagh Educational Institute (Deemed University)
Dayalbagh, Agra-282005
September, 2016

CONTENT OF SYNOPSIS

S. No.	PARTICULAR	PAGE NUMBER
1.	INTRODUCTION	3-4
2.	REVIEW OF LITERATURE	5-7
3.	NEED OF THE STUDY	8
4.	OBJECTIVES OF THE STUDY	9
5.	RESEARCH METHODOLOGY	9-11
6.	PROPOSED CHAPTER PLAN	12
7.	ANNEXURE, REFERENCES & BIBLIOGRAPHY	13-15

ECONOMIC IMPACT OF AGRICULTURE TECHNOLOGY IN INDIA (WITH SPECIAL REFERENCE TO BIHAR)

INTRODUCTION

Technology has a great impact on all aspects of economic life. It is inevitable and essential for accelerated development of under-developed countries. Agriculture technology was introduced in Indian agriculture in the Post-Independence period as a part of strategy of agriculture development. Agriculture technology refers for the production of machines used on a farm to help with farming. Agriculture machines have been designed for practically every stage of the agricultural process. They include machines for tilling the soil, planting seeds, irrigating the land, cultivating crops etc.

Technological integration in agriculture

Technological integration in agriculture can be introduced in two parts: **(a) Land augmenting technological change (b) Labour augmenting technological change**

Land augmenting technological change involves change in biological technique in crop production. It includes mainly high yielding varieties of seeds, fertilizers, irrigation and plant protection measure.

Labour augmenting technological change includes mechanical changes, namely rapid mechanization of agricultural operations, such as introduction of traders combine harvesters. This is associated with the package of agricultural inputs and agricultural practices. The package approach which includes apart from high yielding varieties of seeds, fertilizers, input, weedicides, control over water supply, tractors etc.[1]

AGRICULTURE IN BIHAR

Agriculture is the single largest private sector occupation in Bihar. Agriculture is the key to the overall development of the state economy. Agriculture is still an important sector in Bihar since it contributes about 24.84 percent to State Gross Domestic Product and provides employment to about 77 percent of working force in rural area.[2] The Goal of the agriculture production system should be to maximize income of land owing and landless rural populace to improve their livelihoods. The susceptibility to income and consumption shocks makes it imperative to develop formal agriculture insurance mechanisms to cope with such risks. The objective of the agriculture policy in the state is to increase productivity of major crops so as to bring it close to national average. Opening up of markets has necessitated increased production at competitive prices. Adapting as well as popularizing proven Research and Development efforts is also important. The principle agricultural crops are rice, paddy, wheat, jute, maize, and oil seeds.[3]

Sources:

1. http://sodhganga.inflibnet.ac.in
2. www.krishi.bih.in
3. www.krishi.bih.in

REVIEW OF LITERATURE (TABLE SUMMARY)

Review of literature shows, past research work, idea generation and provides valuable information related to the research works:

NATIONAL REVIEW OF LITERATURE

S. NO	AUTHOR	YEAR	TITLE	FINDINGS
1.	**Santosh K. Sahu and Sukanya Das**	2015	Impact of Agricultural related Technology adoption on poverty	This paper applies a program evaluation technique to assess the causal effect of adoption of agricultural related technologies on consumption by different indices.
2.	**Arundhati Suvaraj, G**	2015	Impact of new Agricultural Technology on income and employment	It is concluded from the analysis that The adoption of new agriculture technology has led to higher rates of growth in production.
3.	**Nooruzzaman**	2015	Impact of Technological change on Agricultural development	It has been found that all together use of various inputs like, irrigation, fertilizers, pesticides, HYV seeds, machineries and tools and literacy are responsible to increasing the crop production.
4.	**Surendra, P.**	2015	Impact of technological intervention on agricultural scenario	It has been found that the farmers who have adopted low cultivation technology, has reduced yield of paddy and sugarcane in Mandya district because seed set treatment, lack of application of bio-fertilizer and imbalanced use of fertilizers, use of old seedlings.
5.	**Singh Nalin**	2014	Pattern of labour use in Bihar Agriculture in the context of changing Technology	In this study to examine the pattern of labour use horizontally in different regions of Bihar and vertically across various farm sizes. The study also attempt to analyses labour use by different irrigation status of the households and also in various crops.
6.	**Sharivastava, Narayani**	2014	Technological changes and agricultural development	This study was an attempt to quantify the new import of new paddy technology on paddy production and Agriculture development.

7.	**Madhurya Prasad**	1989	The development of agriculture in Medinipur district East in the context of the context of Technology Adoption.	It is been found that the sample village identically represents the development pattern of different development zones, due to increasing population pressure on agricultural land.

INTERNATIONAL REVIEW OF LITERATURE

S. NO	AUTHOR	YEAR	TITLE	COUNTRY	FINDINGS
1.	**Adofu, llemona & Shaibu, Susan Ojone & Yakubu, Sulieman**	2011	The Economic impact of improved Agricultural Technology	Nigeria	This result shows that the impact of improved agricultural technologies on cassava productivity is positive. Additionally the results attest to the importance of increasing agricultural productivity in tandem with improvements on the adoption and use of improved agricultural technologies.
2.	**L.O. Ogunsumi, A.A. Adegbite and P.O. Oyekan**	2007	Economic impact assessment of Technology the case of improved soybean varieties	Nigeria	The study on economic impact assessment for the production of improved soybean varieties in Nigeria was carried out in Nigeria using the agronomic data on yield of the nationally coordinated soybean research from two middle zones. The study assesses the economic returns due to improved soybean varieties.

3.	**Sharmistha Self and Richard Grabowsid**	2006	Economic development and the role of Agricultural Technology	Carbondale USA	This paper is an empirical cross-country analysis of agricultural technology's role in economic development, Specifically; the hypothesis being tested is whether improvements in agricultural technology have a significant impact on long-run economic growth.
4.	**Greg Traxler**	2003	Impacts of Biotechnology based Technological innovations	Auburn USA	This paper surveys the level and distribution of the economic impacts of transgenic cotton and reviews the impacts of these crops on chemical pesticide and herbicide use. It concludes with some considerations of ways to address the development and delivery of technological innovations to small farmers in developing countries.
5.	**Robert E. Evenson**	2000	Economic impacts of Agricultural Research and Extension	Bruce	The paper concludes that the agricultural research and extension programs have been built in most of the world economies. A substantial number of economic impact studies evaluating the contributions of research and extension program to increased farm productivity and farm incomes and to consumer welfare have been undertaken in recent years.
6.	**E.S. Ariga & A.M. Kyalo**	1999	Agricultural Technology, Economic viability and poverty alleviation	Kenya	The results show that the power of technological solutions to solve poverty problems currently witnessed in Kenya will be limited unless the myriad of policy. This will also facilitate farm produce to be dispose of easily, creating opportunity to increase farm incomes and thereby alleviating poverty.

RESEARCH GAP

On a deep analysis of all National and International studies Researcher found that, no study has indicated economic benefits derived from technological infusion in agriculture operation in terms of cost of agriculture and rate of change in agriculture production. At the same time, specific and precise analysis of linkages between technology and agriculture operations using statistical model was not found in research paper.

Keeping in view of above mentioned factors, Researcher is proposing to analyze inter-connection between technology and agriculture operations and its economic impact at large.

NEED OF THE STUDY

Agriculture sector plays a very important role in providing employment and food production. In India, a large proportion of population depends on agriculture and agriculture related activities. Economic growth of India largely depends on development of agriculture. Over a period of time extensive use of technology has led to growth in agriculture production all over the world. India is also benefited from technological infusion in agriculture.

With this regard, researcher proposes to develop a specific analysis taking into account economic impact of technological infusion in agriculture operations in terms of Cost, Income and Rate of change in agriculture production, so that it will be helpful in policy formation and forecasting of agriculture production with respect to agriculture technology.

OBJECTIVES OF THE STUDY

The present study is undertaken with the following specific objectives:

1. To identify various technological aspects of Indian agriculture and study its growth over time.
2. To analyze inter-dependence of agriculture technology and agriculture production in Bihar.
3. To study the trend and inter- relation of agriculture production and GDP in Bihar.

Following parameters shall be used to analyze technological infusion in agriculture in Bihar:

a) Cost of agriculture operations.

b) GDP in Bihar.

c) Rate of change in agriculture production.

HYPOTHESIS OF THE STUDY

The following Research questions and hypothesis will be examined during the course of study:

- H_0 – Technology and agriculture production are independent.

RESEARCH METHODOLOGY

In order to achieving the above objectives the following research methodology will be adopted:

(a) Research design: The research design for the study will be Exploratory as well as Analytical because it will be carried out with specific objectives and utilizes the large number of data of Agro climate zones of Bihar.

(b) Sample Area: From the perspective of agriculture in Bihar, the state has been divided into four Agro-climate zones:

S. No.	Bihar Agro-climate zones	Districts represented
1.	**Agro-climate zone (I)**	(i) West Champaran (ii) East Champaran (iii) Siwan (iv) Saran (v) Sitamarhi (vi) Sheohar (vii) Muzaffarpur (viii) Vaishali (ix) Madhubani (x) Darbhanga (xi) Samastipur (xii) Gopalganj (xiii) Begusarai
2.	**Agro-climate zone (II)**	(i) Purnea (ii) Katihar (iii) Saharsa (iv) Supaul (v) Madhepura (vi) Khagaria (vii) Araria (viii) Kishanganj
3.	**Agro-climate zone (III) (A)**	(i) Sheikhpura (ii) Munger (iii) Jamui (iv) Lakhisari (v) Bhagalpur (vi) Banka
4.	**Agro-climate zone (IV) (B)**	(i) Rohtas (ii) Bhojpur (iii) Buxar (iv) Bhabhua (v) Arwal (vi) Patna (vii) Nalanda (viii) Nawada (ix) Jehanabad (x) Aurangabad (xi) Gaya

Source: Directorate of Economics & Statistics, Bihar, Patna.

(c) Sample size: For attaining different objectives, the following Agro-climatic zones and represented Districts will be taken for the study purpose:

S. No.	Bihar Agro-climate zones	District	Total cropped area in Hectare
1.	**Agro-climate zone (I)**	West Champaran	**399802**
2.	**Agro-climate zone (II)**	Araria	**268913**
3.	**Agro-climate zone (III) (A)**	Banka	**165784**
4.	**Agro-climate zone (IV) (B)**	Rohtas	**320244**

Source: Directorate of Economics & Statistics, Bihar, Patna.

Justification of Sample Selection:

(i) On the basis of Agro climate zones of Bihar.

(ii) On the basis of use of Techno-Agriculture in Bihar.

(iii) On the basis of highest cropped area in selected Districts of Agro-climate zones of Bihar.

(d) Data period: For the purpose of analysis of data financial year 2011-2012 onwards.

(e) Data collection: The relevant data will be collected from Primary and secondary sources.

- **Primary Data** will be collected mainly from Structured Interview and visits Agricultural Research Institutions in Bihar.
- **Secondary Data** will be collected mainly from Department of Bihar Agriculture controlled by Ministry of Bihar agriculture. In addition data and information will be also collected from, Agriculture Economics Journals and Government Publications of Bihar etc.

(f) Statistical tools: For the data analysis various statistical tools like Percentage, Comparative analysis and Test of Significance will be employed and also the statistical software like MS Excel and SPSS etc. will be used.

In addition to above stated statistical tools the researcher may adopt few other tools during the course of study.

SPECIFIC RESEARCH METHODOLOGY

To accomplish objectives of the study the researcher will use the following specific Research Methodology will be adopted:

S. No.	OBJECTIVES	RESEARCH METHODOLOGY
1.	To identify various technological aspects of Indian agriculture and study its growth over time.	Content Analysis
2.	To analyze inter-dependence of agriculture technology and agriculture production in Bihar.	Causal analysis
3.	To study the trend and inter-relation of agriculture production and GDP in Bihar.	Time Series Analysis

PROPOSED PLAN OF THE STUDY

CHAPTER- 1	Introduction
CHAPTER- 2	Research outlay
CHAPTER- 3	Techno-Agriculture profile of Bihar
CHAPTER- 4	Analysis (i) Inter-dependence of technology and agriculture in Bihar (ii) Causal analysis of agriculture production and GDP in Bihar (iii) Time series analysis of Technological penetration in Bihar agriculture
CHAPTER- 5	Findings & Suggestions
	Conclusion
	References & Bibliography
	Annexure

ANNEXURE

Glossary of Terms:

1. **Agriculture:** The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.
2. **Agriculture Technology:** Refer to technology for the production of machines used on a farm to help with farming. Agricultural machines have been designed for practically every stage of the agricultural process.
3. **Seeds Technology:** COWAN, 1973: Defined Seed Technology as that "discipline of studies having to do with seed production, maintenance, quality and preservation".
4. **Farming / Fertilizer Technology:** fertilizer is any material of natural or synthetic origin that is applied to soils or to plant tissues to supply one or more plant nutrients essential to the growth of plants.
5. **Agro-climate zones:** Agro-climate zones mainly refer on the basis of soil types, rainfall, temperature and water availability which influences the type of vegetation's.
6. **Gross Domestic Product: GDP** is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. Gross Domestic Product includes all private and public consumption, government outlays, investments and exports minus imports that occur within a defined territory.

REFERENCES

- Das, S. K. (2015, November). Imapct of agricultural related technology adoption on poverty: A study of select households in rural India. India: Madras School of Economics 131/2015.
- Evenson, R. E. (2000, January). Economic impacts of agricultural research and extension. Bruce: Handbook of agricultural economics Bruce.
- Grabowsid, S. S. (2006). Economic devlopment and the role of agricultural technology. Carbondale USA: Southern Illinois University.
- N, S. (2013, August). Impact of the new agricultural technologies in Thoothukudi District Tamilnadu an economic evaluation. India: http://hdl.handle.net/10603/61/61201.
- Nooruzzaman. (2015, October). Impact of technological change on agriculture devlopment in East and West Champaran Districts. India: http://hdl.handle.net/10603/52648.
- Okeyo, W. O. (1999, June). Agricultural technology economic viability and poverty alleviation in Kenya. Kenya: Subsaharan Africa workshop Kenya.
- Oyekan, L. O. (2007). Economic impact assessment of technology the case of improved soybean varieties in Southwest Nigeria. *108 No. 1*. Nigeria: Journal of agriculture and rural devlopment.
- Prasad, M. (1989, December). The devlopment of agriculture in Medinipur District East in the context of technology adoption. India: http://hdl.handle.net/10603/68454.
- Prasad, S. (2015). Impact of technological intervention on agricultural scenario in Mandya District Karnataka. India: http://hdl.handle.net/10603/107224.
- Sharivastava, N. (2014, December). Technological changes and agricultural devlopment in Chhattisgarh region of M.P. India: http://hdl.handle.net/10603/31493.
- Singh, N. (2014, March). Pattern of labour use in Bihar agriculture in the context of changing technology. India: http://hdl.handle.net/10603/16785.

- Sulieman, A. I. (2011). The economic impact of improved agricultural technology on cassava productivity in Kogi state of Nigeria. Nigeria: International journal of food and agricultural economics ISSN 2147-8988 Vol. No. 1.
- Suvaraj, A. (2015). Impact of new agricultural technology on income and employment in Kurnool district of Andhra Pradesh. India: http://hdl.handle.net/10603/42435.
- Traxler, G. (2003, July). The economic impacts of biotechnology based technological innovations. Auburn USA: ESA working paper No. 03- XX.

BIBLIOGRAPHY

- **Websites:**
  - http://sodhganga.inflibnet.ac.in
  - www.krishi.bih.in
  - www.krishimis.in

Gaurav Kumar Saurabh	**Dr. Saurabh Mani**	**Dr. Suneshwer Prasad**
Research Scholar	Supervisor	Co- Supervisor

Prof. S P Kaushik

Head, Dept. of Applied Business Economics

Dean, Faculty of Commerce